Zero Boil-Off Tank Experiment-2 (ZBOT-2)

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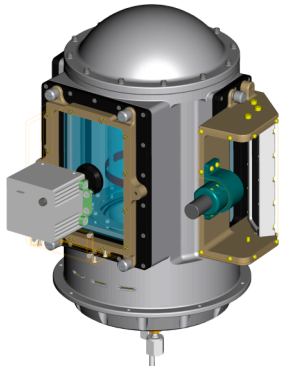

Vacuum Jacket/Test Tank Assembly with Camera Package

Objective:

Aid the design of space-based cryogenic storage systems in response to the moderate-and long-termneeds of NASA's Constellation Program as specified by the Lunar and Mars Architectures and their ISRU elements:

- Obtain microgravity two-phase flow and heat transfer data for destratification and pressure reduction through active cooling in ventless Dewars.
- Provide high quality microgravity data under controlled conditions for validation and verification of tank pressure control models and CFD codes.
- Use data and CFD models to assess and optimize active and dynamic pressure control systems for the space-based cryogenic storage tanks.

Relevance/Impact:

- Reduces launch mass and decreases risks through enabling design concepts for long-term storage of cryogenic fluids.
- Cost effective and reliable cryogenic storage for both life support and propulsion systems satisfying the requirements for long term mission scenarios from Moon to Mars and beyond.

Development Approach:

- Ground phase: develop ground-based experiment and obtain 1-g data for tank pressurization and pressure control.
- Flight phase: develop ISS experiment and obtain microgravity data for tank pressurization and pressure control.
- Develop a state-of-the art two-phase CFD model for tank pressurization and pressure control.
- Validate and Verify (V&V) the CFD model with microgravity and 1g data.
- Use the validated CFD model and empirical correlations derived from the 1g and microgravity data for scale-up tank design.

ISS Resource Requirements

Accommodation (carrier)	Fluids Integrated Rack
Upmass (kg) (w/o packing factor)	80 - 100 kg
Volume (m^3) (w/o packing factor)	0.10 - 0.12 m^3
Power (kw) (peak)	0.100 kW
Crew Time (hrs) (installation/operations)	15 - 20 hrs. total
Launch/Increment	TBD

Project Life Cycle Schedule

Milestones	RCR	RDR	PDR	CDR	VRR	Phase III Safety	FHA	Launch	Ops	Return	Final Report
Actual/ Baseline	TBD	FY11	FY12	FY13	TBD	TBD	FY14	TBD	TBD	TBD	TBD
Documentation	Website: eRoom:				SRD: EDMP:			Project Plan: SEMP:			

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